

August 28, 2020

Georgia Ports Authority
P.O. Box 2406
Savannah, Georgia 31402-2406

Attn: Randy C. Weitman, P.E. / Manager of Engineering Services
E: rweitman@gaports.com

Re: Interim Remediation Progress Report No. 2
Mayor's Point Terminal
1100 Bay Street
Brunswick, Glynn County, Georgia
Terracon Project No. ES187335

Dear Mr. Weitman:

Terracon Consultants, Inc. (Terracon) is pleased to submit this letter to the Georgia Port Authority (GPA) summarizing the interim remediation activities conducted at the above referenced site from August 7 through August 16, 2020. Interim remediation activities included the completion of a 24-hour high vacuum remediation (HVR) event and a weekly monitoring event. Interim remediation activities are being performed in response to an Administrative Order issued to GPA by the U.S. Coast Guard (USCG) on June 27, 2020.

1.0 PROJECT BACKGROUND

The site is located on the south end of GPA's Mayor's Point Terminal in Brunswick, Glynn County, Georgia (site). The site is leased by Moran for tugboat operations and consists of a concrete dock, office building, maintenance building, equipment wash pad, storage containers, and asphalt paved roadways and parking areas. The site location and general vicinity is depicted on Figure 1 in Attachment A. A diagram of the site is depicted on Figure 2 in Attachment A.

USCG Marine Safety Unit (MSU) Savannah received reports of an oily sheen with a petroleum odor of an unknown origin on the East River adjacent at the site. At the request of GPA, Terracon commenced site investigation activities in September 2018 to identify the source and determine the nature and extent of contamination. Site investigation activities included the installation of twelve (12) monitoring wells (denoted as MW-1 thru MW-12) and two recovery wells (denoted as RW-1 and RW-2). Well locations are shown on Figure 2 in Attachment A.

Free product and dissolved phase contamination associated with a weathered gasoline has been identified within the subsurface soil and shallow groundwater at the site. The extent of subsurface



contamination has been delineated to the extent feasible on the site. A review of historical documents, two geophysical surveys, and several exploratory excavations have not identified a source of contamination at the site. Based on the configuration of the groundwater plume, the contamination appears to be migrating onto the site from the southern adjoining property.

On behalf of GPA, Terracon coordinated with environmental contractors to perform four (4) vacuum extraction events in June and July 2019 to remove free product, contaminated groundwater, and subsurface vapors from the well network. The vacuum extraction events removed a total of approximately 4,744 gallons of petroleum contact water and 1,215 equivalent gallons of hydrocarbons from the subsurface at the site.

In a meeting with GPA and Terracon on December 9, 2019, USCG noted that GPA had done all that it could to identify the source of contamination and agreed that the source of the contamination appeared to be coming from the southern adjoining property. USCG indicated they would take action to investigate the southern adjoining property and that no further action was warranted for GPA. However, USCG issued an Administrative Order on June 27, 2020, for GPA to undertake the following actions:

1. Continuously monitor for any discharge of oil from the Mayor's Point property, making all required notifications for any such discharge(s).
2. Continue the investigation into whether the source of this discharge is on GPA property.
3. Establish measures to remove any potential sources and mitigate or prevent the discharge of any oil into the East River, to the satisfaction of the Federal On-Scene Coordinator.

In response to the Administrative Order, GPA contracted Terracon to install an oil absorbent boom along the shoreline; perform periodic site visits to observe river conditions, adjust the boom, and collect fluid levels from the well network; and conduct HVR events to remove free product, contaminated groundwater, and subsurface vapors from the subsurface.

Interim response actions were resumed with the installation of the oil absorbent boom on July 20, 2020. The boom deployment was followed by a 104-hour HVR event completed between July 27, 2020 through July 31, 2020. The 104-hour HVR event incinerated approximately 4,993 equivalent gallons of gasoline and removed 2,650 gallons of petroleum contact water. Terracon also conducted well gauging events on July 20, 2020 and August 6, 2020. These initial response actions are summarized in Interim Remediation Progress Report No. 1 dated August 13, 2020.

2.0 HIGH VACUUM REMEDIATION EVENT

Terracon worked with Fruits & Associates (Fruits) of Acworth, Georgia, to conduct a 24-hour HVR event starting on August 10, 2020. The purpose of the HVR event was to extract free product, contaminated groundwater, and subsurface vapors from the existing well network to reduce and/or eliminate the petroleum odor and sheen along the shoreline at the site.

Prior to starting the HVR event, fluid levels were collected from the monitoring well network using a Solinst® oil-water interface probe. Free product was detected in wells MW-1 (0.01 feet), MW-2 (0.04 feet), MW-3 (0.21 feet), MW-4 (0.05 feet), MW-5 (0.01 feet), MW-10 (0.02 feet), and RW-2 (0.44 feet). A summary of fluid level measurements, free product thicknesses, and groundwater elevation data is presented in Table 1 in Attachment B.

Based on the current and / or historical presence of free product, the vacuum extraction system was connected to wells MW-2, MW-3, MW-4, MW-5, and RW-2. Stingers were initially set at the static fluid level and were then adjusted as fluid levels fluctuated through the HVR event. The HVR unit extracted subsurface vapors and liquids simultaneously from the five (5) wells throughout the HVR event.

During the extraction event, the combined air and liquids were piped to the mobile treatment system where the liquids were separated with a scrubber / knockout system and discharged into a storage tank for future disposal and the hydrocarbon vapors were transferred to the off-gas treatment system. The off-gas treatment system used a forced air thermal oxidation unit operating at 1,500 degrees Fahrenheit to incinerate the hydrocarbon vapors. Throughout the event, air concentration measurements were recorded periodically from both the influent and effluent sample ports.

The 24-hour HVR event was completed on August 11, 2020. The air concentration data were used to calculate mass removal volumes, which indicated that 3,497.39 pounds of hydrocarbons (567.76 equivalent gallons of gasoline) were incinerated during the extraction event. The total off-gas discharge (to the atmosphere) was 0.07925 pounds of hydrocarbon, indicating a 99.9% destruction rate for the thermal oxidation unit. Fruit's report summarizing the technology and results of the HVR event is included in Attachment C.

Following the conclusion of the HVR event, a second round of fluid level measurements were collected from the monitoring well network using a Solinst® oil-water interface probe. Free product was detected in wells MW-1 (0.19 feet), MW-2 (0.15 feet), MW-3 (0.08 feet), MW-4 (0.35 feet), MW-5 (0.42 feet), MW-9 (0.15 feet), MW-10 (0.08 feet), and RW-2 (0.05 feet). A summary of fluid level measurements, free product thicknesses, and groundwater elevation data is presented in Table 1 in Attachment B.

A total of 590 gallons of petroleum-impacted groundwater were extracted and contained in the holding tank during the HVR event. The petroleum-impacted groundwater was transported by Fruits to the Aqua-Terra Recycling & Treatment facility in Oxford, Georgia for disposal. A copy of the waste manifest is included in Attachment C.

3.0 WEEKLY MONITORING EVENT

Following the completion of the 24-hour HVR event, Terracon conducted well gauging event on August 13, 2020. Fluid levels were measured in each monitoring well using a Solinst® oil-water interface probe. The oil-water interface probe was decontaminated in the field with Alconox® detergent and distilled water between gauging each well. A summary of fluid level measurements, free product thicknesses, and groundwater elevation data is presented in Table 1 in Attachment B.

During the well gauging event, Terracon also checked on the condition of the oil absorbent boom and observed the shoreline for sheen and petroleum odors. An oily sheen and petroleum odor were noted along the riverbank during the monitoring event. Thus far, the boom has been observed to be in good condition and appears to be intercepting the oily sheen before it disperses further out into the river. Terracon will continue weekly monitoring events for up to four (4) weeks following the last HVR event.

4.0 CONCLUSIONS

Since interim remediation activities were initiated in June 2019, vacuum extraction events have removed approximately 6,776 equivalent gallons of gasoline and 7,984 gallons of petroleum contact water from the subsurface at the site. Terracon plans to conduct weekly 24-hour HVR events throughout the month of August 2020 to continue to extract free product, contaminated groundwater, and subsurface vapors from the subsurface with the intention of reducing and/or eliminating the petroleum odor and oily sheen along the shoreline at the site.

5.0 LIMITATIONS

5.1 Standard of Care

Terracon's services were performed in a manner consistent with generally accepted practices of the profession undertaken in similar studies in the same geographical area during the same time period. Terracon makes no warranties, either express or implied, regarding the findings, conclusions, or recommendations. Please note that Terracon does not warrant the work of

laboratories, regulatory agencies or other third parties supplying information used in the preparation of the report. These environmental services were performed in accordance with the scope of work agreed with you, our client.

5.2 Additional Scope Limitations

Findings, conclusions, and recommendations resulting from these services are based upon information derived from the on-site activities and other services performed under this scope of work; such information may be subject to change over time. Certain indicators of the presence of hazardous substances, petroleum products, or other constituents may have been latent, inaccessible, unobservable, non-detectable or not present during these services, and we cannot represent that the site contains no hazardous substances, toxic materials, petroleum products, or other latent conditions beyond those identified during these interim remediation activities.

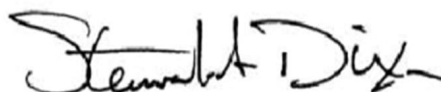
Subsurface conditions may vary from those encountered at specific borings or wells or during other surveys, tests, assessments, investigations or exploratory services. The data, interpretations, findings, and our recommendations are based solely upon data obtained at the time and within the agreed upon scope of services.

We appreciate the opportunity to be of service to you on this project. If there are any questions regarding this report, please do not hesitate to contact us.

Sincerely,

Terracon Consultants, Inc.

Justin J. Johnson, PG
Senior Geologist



Stewart A. Dixon, PG
Environmental Department Manager

Attachments:

Attachment A – Figures

Attachment B – Table

Attachment C – Fruit's HVR Event Report

ATTACHMENT A

FIGURES

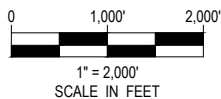
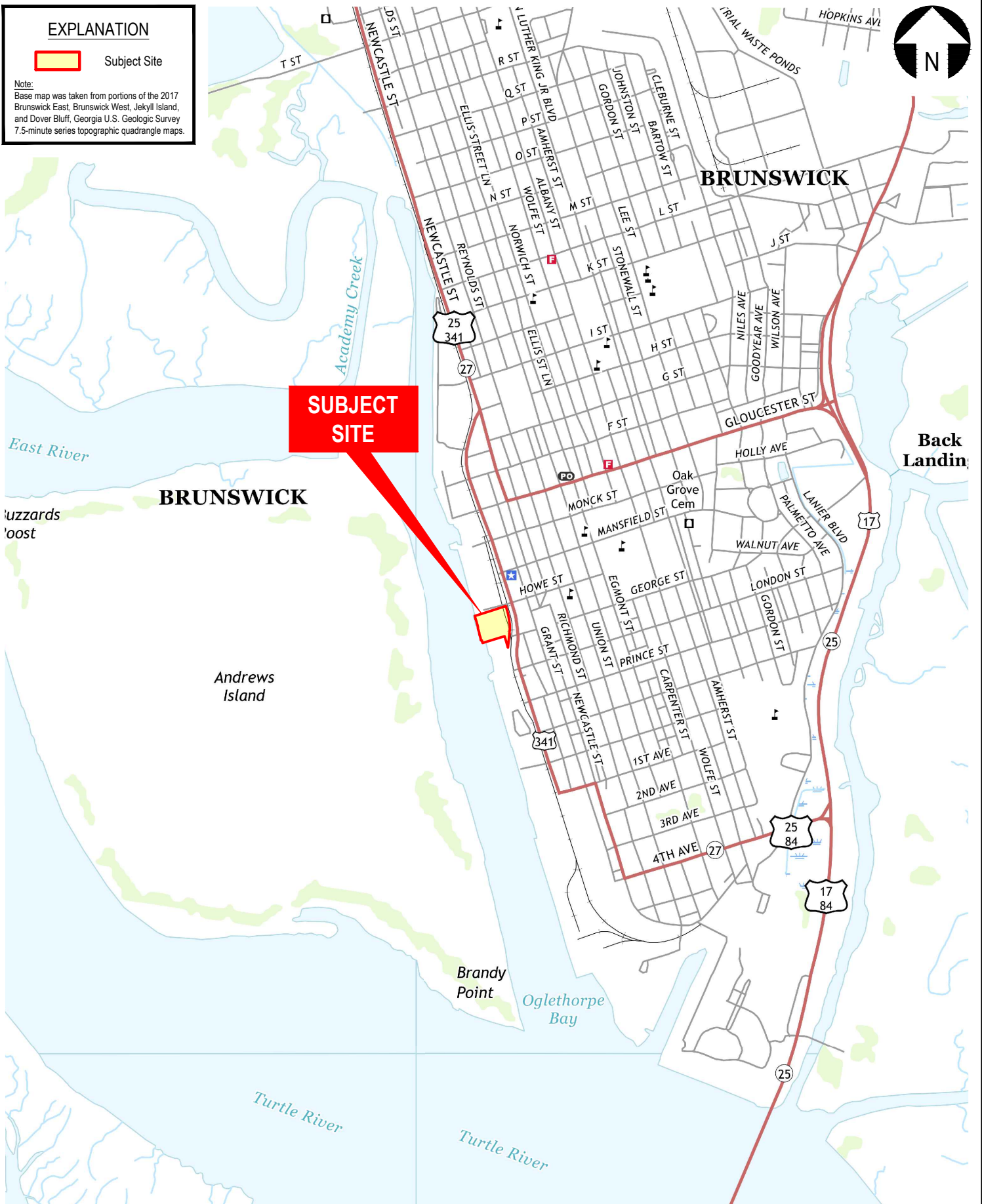
EXPLANATION



Subject Site

Note:

Base map was taken from portions of the 2017 Brunswick East, Brunswick West, Jekyll Island, and Dover Bluff, Georgia U.S. Geologic Survey 7.5-minute series topographic quadrangle maps.



Project Mgr: WSA
 Drawn By: JDG
 Checked By: JJJ
 Approved By: WSA

Project No. ES187335
 Scale: AS SHOWN
 File Name: ES187335jdg.dwg
 Date: July 27, 2020

Terracon
 Consulting Engineers & Scientists

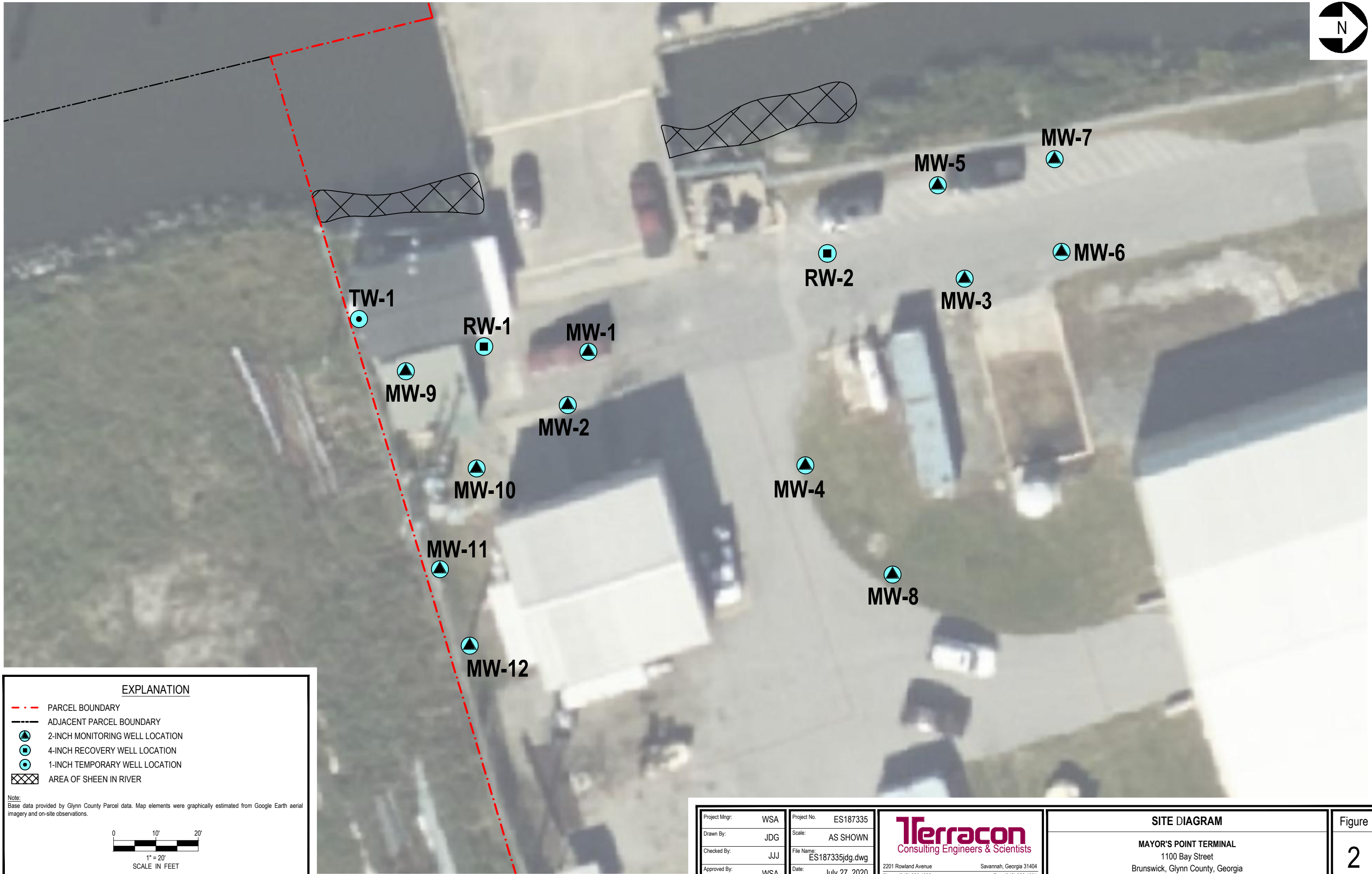
2201 Rowland Avenue Savannah, Georgia 31404
 Phone (912) 629 4000 Fax: (912) 629 4001

GENERAL VICINITY MAP

MAYOR'S POINT TERMINAL
 1100 Bay Street
 Brunswick, Glynn, Georgia

Figure

1



ATTACHMENT B

TABLE

Mayor's Point Terminal
1100 Bay Street
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Terracon Project No.: ES187335

TABLE 1: FLUID LEVEL MEASUREMENTS

| Well ID | Date | Top of Casing Elevation (ft) | Depth of Screened Interval (ft bgs) | Depth to Product (ft btoc) | Depth to Water (ft btoc) | Product Thickness (ft) | Specific Gravity Adjustment | Corrected Depth to Water (ft) | Groundwater Elevation (ft) |
|---------|------------|------------------------------|-------------------------------------|----------------------------|--------------------------|------------------------|-----------------------------|-------------------------------|----------------------------|
| RW-1 | 6/21/2019 | 6.04 | 5 - 20 | -- | 5.02 | -- | -- | -- | 1.02 |
| | 6/24/2019 | | | -- | 4.80 | -- | -- | -- | 1.24 |
| | 6/26/2019 | | | -- | 4.80 | -- | -- | -- | 1.24 |
| | 6/28/2019 | | | -- | 4.77 | -- | -- | -- | 1.27 |
| | 7/3/2019 | | | -- | 4.57 | -- | -- | -- | 1.47 |
| | 7/9/2019 | | | -- | 4.73 | -- | -- | -- | 1.31 |
| | 7/15/2019 | | | 4.93 | 5.04 | 0.11 | 0.08 | 4.96 | 1.08 |
| | 7/22/2019 | | | 5.31 | 5.61 | 0.30 | 0.22 | 5.39 | 0.65 |
| | 7/23/2019 | | | 5.3 | 5.57 | 0.27 | 0.20 | 5.37 | 0.67 |
| | 10/24/2019 | | | -- | 4.12 | -- | -- | -- | 1.92 |
| | 7/20/2020 | | | -- | 4.41 | -- | -- | -- | 1.63 |
| | 7/27/2020 | | | -- | 5.61 | -- | -- | -- | 0.43 |
| | 7/31/2020 | | | -- | 5.07 | -- | -- | -- | 0.97 |
| | 8/6/2020 | | | -- | 4.02 | -- | -- | -- | 2.02 |
| | 8/10/2020 | | | -- | 4.11 | -- | -- | -- | 1.93 |
| | 8/13/2020 | | | -- | 4.47 | -- | -- | -- | 1.57 |
| MW-1 | 6/21/2019 | 6.41 | 5 - 20 | -- | 5.20 | -- | -- | -- | 1.21 |
| | 6/24/2019 | | | -- | 5.03 | -- | -- | -- | 1.38 |
| | 6/26/2019 | | | -- | 5.01 | -- | -- | -- | 1.40 |
| | 6/28/2019 | | | -- | 5.07 | -- | -- | -- | 1.34 |
| | 7/3/2019 | | | -- | 4.79 | -- | -- | -- | 1.62 |
| | 7/9/2019 | | | -- | 4.90 | -- | -- | -- | 1.51 |
| | 7/15/2019 | | | 5.05 | 5.54 | 0.49 | 0.36 | 5.18 | 1.23 |
| | 7/22/2019 | | | 5.45 | 5.53 | 0.08 | 0.06 | 5.47 | 0.94 |
| | 7/23/2019 | | | 5.61 | 5.71 | 0.10 | 0.07 | 5.64 | 0.77 |
| | 10/24/2019 | | | 4.25 | 4.48 | 0.23 | 0.17 | 4.31 | 2.10 |
| | 7/20/2020 | | | 5.53 | 5.78 | 0.25 | 0.18 | 5.60 | 0.81 |
| | 7/27/2020 | | | 4.79 | 4.91 | 0.12 | 0.09 | 4.82 | 1.59 |
| | 7/31/2020 | | | 5.22 | 5.35 | 0.13 | 0.09 | 5.26 | 1.15 |
| | 8/6/2020 | | | 4.22 | 4.39 | 0.17 | 0.12 | 4.27 | 2.14 |
| | 8/10/2020 | | | 4.32 | 4.33 | 0.01 | 0.01 | 4.32 | 2.09 |
| | 8/13/2020 | | | 4.7 | 4.87 | 0.17 | 0.12 | 4.75 | 1.66 |

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|---------|------------|------------------------------------|---|-------------------------------|-----------------------------|------------------------------|--------------------------------|-------------------------------------|----------------------------------|
| MW-2 | 6/21/2019 | 6.62 | 5 - 20 | -- | 5.50 | -- | -- | -- | 1.12 |
| | 6/24/2019 | | | 5.44 | 5.55 | 0.11 | 0.08 | 5.47 | 1.15 |
| | 6/26/2019 | | | 5.39 | 5.55 | 0.16 | 0.12 | 5.43 | 1.19 |
| | 6/28/2019 | | | 5.38 | 5.56 | 0.18 | 0.13 | 5.43 | 1.19 |
| | 7/3/2019 | | | 5.13 | 5.35 | 0.22 | 0.16 | 5.19 | 1.43 |
| | 7/9/2019 | | | 5.21 | 5.50 | 0.29 | 0.21 | 5.29 | 1.33 |
| | 7/15/2019 | | | 5.75 | 5.85 | 0.10 | 0.07 | 5.78 | 0.84 |
| | 7/22/2019 | | | 5.82 | 6.32 | 0.50 | 0.36 | 5.96 | 0.66 |
| | 7/23/2019 | | | 7.08 | 7.22 | 0.14 | 0.10 | 7.12 | -0.50 |
| | 10/24/2019 | | | 4.63 | 4.78 | 0.15 | 0.11 | 4.67 | 1.95 |
| | 7/20/2020 | | | 5.03 | 5.12 | 0.09 | 0.07 | 5.05 | 1.57 |
| | 7/27/2020 | | | 5.21 | 5.37 | 0.16 | 0.12 | 5.25 | 1.37 |
| | 7/31/2020 | | | 5.71 | 5.74 | 0.03 | 0.02 | 5.72 | 0.90 |
| | 8/6/2020 | | | 4.59 | 4.66 | 0.07 | 0.05 | 4.61 | 2.01 |
| | 8/10/2020 | | | 4.73 | 4.77 | 0.04 | 0.03 | 4.74 | 1.88 |
| | 8/13/2020 | | | 5.04 | 5.25 | 0.21 | 0.15 | 5.10 | 1.52 |
| MW-3 | 6/21/2019 | 6.11 | 5 - 20 | 5.17 | 6.74 | 1.57 | 1.14 | 5.60 | 0.51 |
| | 6/24/2019 | | | 7.95 | 8.25 | 0.30 | 0.22 | 8.03 | -1.92 |
| | 6/26/2019 | | | 5.25 | 6.30 | 1.05 | 0.77 | 5.53 | 0.58 |
| | 6/28/2019 | | | 4.96 | 5.45 | 0.49 | 0.36 | 5.09 | 1.02 |
| | 7/3/2019 | | | 4.57 | 4.87 | 0.30 | 0.22 | 4.65 | 1.46 |
| | 7/9/2019 | | | 5.45 | 6.05 | 0.60 | 0.44 | 5.61 | 0.50 |
| | 7/15/2019 | | | 5.32 | 6.58 | 1.26 | 0.92 | 5.66 | 0.45 |
| | 7/22/2019 | | | 5.59 | 7.14 | 1.55 | 1.13 | 6.01 | 0.10 |
| | 7/23/2019 | | | 5.56 | 7.12 | 1.56 | 1.14 | 5.98 | 0.13 |
| | 10/24/2019 | | | 4.90 | 5.45 | 0.55 | 0.40 | 5.05 | 1.06 |
| | 7/20/2020 | | | 4.81 | 5.10 | 0.29 | 0.21 | 4.89 | 1.22 |
| | 7/27/2020 | | | 5.11 | 5.66 | 0.55 | 0.40 | 5.26 | 0.85 |
| | 7/31/2020 | | | 5.80 | 6.62 | 0.82 | 0.60 | 6.02 | 0.09 |
| | 8/6/2020 | | | 4.31 | 4.65 | 0.34 | 0.25 | 4.40 | 1.71 |
| | 8/10/2020 | | | 4.92 | 5.13 | 0.21 | 0.15 | 4.98 | 1.13 |
| | 8/13/2020 | | | 5.40 | 5.94 | 0.54 | 0.39 | 5.55 | 0.56 |

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|---------|------------|------------------------------|-------------------------------------|----------------------------|--------------------------|------------------------|-----------------------------|-------------------------------|----------------------------|
| MW-4 | 6/21/2019 | 7.03 | 5 - 20 | -- | 5.71 | -- | -- | -- | 1.32 |
| | 6/24/2019 | | | -- | 5.71 | -- | -- | -- | 1.32 |
| | 6/26/2019 | | | -- | 5.55 | -- | -- | -- | 1.48 |
| | 6/28/2019 | | | -- | 5.60 | -- | -- | -- | 1.43 |
| | 7/3/2019 | | | 5.30 | 5.46 | 0.16 | 0.12 | 5.34 | 1.69 |
| | 7/9/2019 | | | 5.35 | 5.70 | 0.35 | 0.26 | 5.44 | 1.59 |
| | 7/15/2019 | | | 5.72 | 6.01 | 0.29 | 0.21 | 5.80 | 1.23 |
| | 7/22/2019 | | | 6.01 | 6.42 | 0.41 | 0.30 | 6.12 | 0.91 |
| | 7/23/2019 | | | 6.13 | 6.16 | 0.03 | 0.02 | 6.14 | 0.89 |
| | 10/24/2019 | | | 4.81 | 4.94 | 0.13 | 0.09 | 4.85 | 2.18 |
| | 7/20/2020 | | | 5.18 | 5.31 | 0.13 | 0.09 | 5.22 | 1.81 |
| | 7/27/2020 | | | 5.34 | 5.51 | 0.17 | 0.12 | 5.39 | 1.64 |
| | 7/31/2020 | | | 5.81 | 5.84 | 0.03 | 0.02 | 5.82 | 1.21 |
| | 8/6/2020 | | | 4.77 | 4.80 | 0.03 | 0.02 | 4.78 | 2.25 |
| | 8/10/2020 | | | 4.88 | 4.93 | 0.05 | 0.04 | 4.89 | 2.14 |
| | 8/13/2020 | | | 5.23 | 5.41 | 0.18 | 0.13 | 5.28 | 1.75 |
| MW-5 | 7/9/2019 | 5.25 | 3 - 13 | 6.47 | 6.66 | 0.19 | 0.14 | 6.52 | -1.27 |
| | 7/15/2019 | | | -- | 5.85 | -- | -- | -- | -0.44 |
| | 7/22/2019 | | | 5.45 | 6.35 | 0.90 | 0.66 | 5.69 | -0.44 |
| | 7/23/2019 | | | 6.40 | 6.48 | 0.08 | 0.06 | 6.42 | -6.42 |
| | 10/24/2019 | | | -- | 6.00 | -- | -- | -- | -6.00 |
| | 7/20/2020 | | | 4.60 | 4.65 | 0.05 | 0.04 | 4.61 | -4.61 |
| | 7/27/2020 | | | 5.89 | 5.97 | 0.08 | 0.06 | 5.91 | -0.66 |
| | 7/31/2020 | | | 6.71 | 6.78 | -- | -- | -- | -1.53 |
| | 8/6/2020 | | | 3.97 | 4.00 | 0.03 | 0.02 | 3.98 | 1.27 |
| | 8/10/2020 | | | 6.01 | 6.02 | 0.01 | 0.01 | 6.01 | -0.76 |
| | 8/13/2020 | | | 6.24 | 6.92 | 0.68 | 0.50 | 6.42 | -1.17 |

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|---------|------------|------------------------------|-------------------------------------|----------------------------|--------------------------|------------------------|-----------------------------|-------------------------------|----------------------------|
| MW-6 | 7/9/2019 | 5.77 | 4 - 14 | -- | 6.17 | -- | -- | -- | -0.40 |
| | 7/15/2019 | | | -- | 5.97 | -- | -- | -- | -0.20 |
| | 7/22/2019 | | | -- | 5.74 | -- | -- | -- | 0.03 |
| | 7/23/2019 | | | -- | 6.42 | -- | -- | -- | -0.65 |
| | 10/24/2019 | | | -- | 5.66 | -- | -- | -- | 0.11 |
| | 7/20/2020 | | | -- | 5.89 | -- | -- | -- | -0.12 |
| | 7/27/2020 | | | -- | 5.83 | -- | -- | -- | -0.06 |
| | 7/31/2020 | | | -- | 5.99 | -- | -- | -- | -0.22 |
| | 8/6/2020 | | | -- | 4.04 | -- | -- | -- | 1.73 |
| | 8/10/2020 | | | -- | 5.64 | -- | -- | -- | 0.13 |
| MW-7 | 7/9/2019 | 5.38 | 3 - 13 | -- | 7.50 | -- | -- | -- | -2.12 |
| | 7/15/2019 | | | -- | 7.80 | -- | -- | -- | -2.42 |
| | 7/22/2019 | | | -- | 6.08 | -- | -- | -- | -0.70 |
| | 7/23/2019 | | | -- | 6.35 | -- | -- | -- | -0.97 |
| | 10/24/2019 | | | -- | 7.01 | -- | -- | -- | -1.63 |
| | 7/20/2020 | | | -- | 5.27 | -- | -- | -- | 0.11 |
| | 7/27/2020 | | | -- | 6.73 | -- | -- | -- | -1.35 |
| | 7/31/2020 | | | -- | 6.84 | -- | -- | -- | -1.46 |
| | 8/6/2020 | | | -- | 3.97 | -- | -- | -- | 1.41 |
| | 8/10/2020 | | | -- | 6.78 | -- | -- | -- | -1.40 |
| | 8/13/2020 | | | -- | 6.69 | -- | -- | -- | -1.31 |
| MW-8 | 7/9/2019 | 7.33 | 3 - 13 | -- | 5.35 | -- | -- | -- | 1.98 |
| | 7/15/2019 | | | 6.11 | 6.12 | 0.01 | 0.01 | 6.11 | 1.22 |
| | 7/22/2019 | | | -- | 6.38 | -- | -- | -- | 0.95 |
| | 7/23/2019 | | | -- | 6.45 | -- | -- | -- | 0.88 |
| | 10/24/2019 | | | -- | 5.20 | -- | -- | -- | 2.13 |
| | 7/20/2020 | | | -- | 5.65 | -- | -- | -- | 1.68 |
| | 7/27/2020 | | | -- | 5.78 | -- | -- | -- | 1.55 |
| | 7/31/2020 | | | -- | 6.12 | -- | -- | -- | 1.21 |
| | 8/6/2020 | | | -- | 5.23 | -- | -- | -- | 2.10 |
| | 8/10/2020 | | | -- | 5.32 | -- | -- | -- | 2.01 |
| | 8/13/2020 | | | -- | 5.67 | -- | -- | -- | 1.66 |

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|---------|------------|------------------------------|-------------------------------------|----------------------------|--------------------------|------------------------|-----------------------------|-------------------------------|----------------------------|
| MW-9 | 10/24/2019 | 5.66 | 2 - 12 | -- | 4.52 | -- | -- | -- | 1.14 |
| | 7/20/2020 | | | -- | 4.89 | -- | -- | -- | 0.77 |
| | 7/27/2020 | | | -- | 5.02 | -- | -- | -- | 0.64 |
| | 7/31/2020 | | | -- | 5.50 | -- | -- | -- | 0.16 |
| | 8/6/2020 | | | -- | 4.46 | -- | -- | -- | 1.20 |
| | 8/10/2020 | | | -- | 4.51 | -- | -- | -- | 1.15 |
| | 8/13/2020 | | | 4.91 | 4.97 | 0.06 | 0.04 | 4.93 | 0.73 |
| MW-10 | 10/24/2019 | 7.17 | 2 - 12 | 5.26 | 6.80 | 1.54 | 1.12 | 5.68 | 1.49 |
| | 7/20/2020 | | | 5.64 | 5.75 | 0.11 | 0.08 | 5.67 | 1.50 |
| | 7/27/2020 | | | 5.75 | 5.89 | 0.14 | 0.10 | 5.79 | 1.38 |
| | 7/31/2020 | | | -- | 6.15 | -- | -- | -- | 1.02 |
| | 8/6/2020 | | | 5.22 | 5.30 | 0.08 | 0.06 | 5.24 | 1.93 |
| | 8/10/2020 | | | 5.31 | 5.33 | 0.02 | 0.01 | 5.32 | 1.85 |
| | 8/13/2020 | | | 5.68 | 5.80 | 0.12 | 0.09 | 5.71 | 1.46 |
| MW-11 | 10/24/2019 | 7.19 | 2 12 | 5.30 | 6.80 | 1.50 | 1.09 | 5.71 | 1.48 |
| | 7/20/2020 | | | -- | 5.65 | -- | -- | -- | 1.54 |
| | 7/27/2020 | | | -- | 5.70 | -- | -- | -- | 1.49 |
| | 7/31/2020 | | | -- | 5.97 | -- | -- | -- | 1.22 |
| | 8/6/2020 | | | -- | 5.26 | -- | -- | -- | 1.93 |
| | 8/10/2020 | | | -- | 5.43 | -- | -- | -- | 1.76 |
| | 8/13/2020 | | | -- | 5.60 | -- | -- | -- | 1.59 |
| MW-12 | 10/24/2019 | 7.57 | 2 - 12 | -- | 5.50 | -- | -- | -- | 2.07 |
| | 7/20/2020 | | | -- | 5.82 | -- | -- | -- | 1.75 |
| | 7/27/2020 | | | -- | 5.94 | -- | -- | -- | 1.63 |
| | 7/31/2020 | | | -- | 6.01 | -- | -- | -- | 1.56 |
| | 8/6/2020 | | | -- | 5.50 | -- | -- | -- | 2.07 |
| | 8/10/2020 | | | -- | 5.59 | -- | -- | -- | 1.98 |
| | 8/13/2020 | | | -- | 5.75 | -- | -- | -- | 1.82 |

NOTES:

-- = No Measureable Free Product (equivalent to 0.00')

ft btoc = feet below top of casing

ft = feet

ρ_{LNAPL} = 0.729 g/mL from American Petroleum Institute, 1996, A Guide to the Assessment and Remediation of Petroluem Releases, 3rd edition.

ATTACHMENT C

HIGH VACUUM REMEDIATION EVENT REPORT



August 14, 2020

Justin Johnson
Terracon
2201 Rowland Avenue
Savannah, Georgia

500 Northpoint Pkwy SE
Acworth, GA 30102
www.fruits-us.com
(866) 974-6999
(770) 974-6999

Subject:
24.0 hour High-Vacuum Remediation Event #7
Mayor's Point
1100 Bay Street
Brunswick, Georgia
Fruits Project: GA20-9218

Mr. Johnson:

Fruits & Associates, Inc. is pleased to provide this summary of the High-Vacuum Remediation event that was conducted on August 10th, 2020 at the above referenced facility. Below is a summary of both the technology as well as the results of the actual event.

Technology:

High-Vacuum Remediation (HVR) involves the extraction of subsurface vapors and liquids via a monitoring well or recovery well. This is accomplished by applying high levels of vacuum pressure to the extraction point. To eliminate mounding of the water table, a drop tube (commonly known as a stinger) is inserted in the well to the static water level depth. The applied vacuum and airflow extracted from the well is pulled through this drop tube. As the water table attempts to mound due to the application of vacuum, the liquids are "slurped" through this drop tube. This slurping effectively maintains the static conditions of the water table while the elevated vacuum is applied to the well during the event. In order to minimize any change to the current smear zone associated with the site, seasonal water level data is analyzed. Once the extraction process is underway, the inlet of the stinger assembly is slowly lowered to the maximum historical water level observed for each extraction well. This draw down (one to ten feet below the static water level) depresses the water table and creates a cone of influence, which maximizes the efficiency of the high vacuum process.

Occasionally, fresh air (5 to 25 CFM) is introduced at the well surface to increase the airflow and enhance the liquid removal rate. In order to accurately record the actual removal rate from the well, an airflow gauge is mounted on the well head to measure the amount of fresh air that is introduced. This extra fresh air is subtracted from the total flow calculated for each extraction well. Additionally, two vacuum gauges are installed; one on the stinger assembly (well head vacuum), and one on the well casing (influence vacuum). If fresh air is introduced at the well head, the influence vacuum reading will be artificially lower than the actual applied vacuum because the inlet for fresh air is adjacent to this vacuum gauge port. The setup and piping configurations are shown in Figure #1.

During the extraction process, the combined air and liquids are transferred to the mobile treatment system where the liquids are separated with a liquid scrubber / knockout system and discharged into a storage tank for future disposal. The hydrocarbon vapors are transferred to the off-gas treatment system and are incinerated in a forced air Thermal Oxidation (ThOx) unit at 1500 degrees Fahrenheit. After thorough destruction of the contaminants in the air stream, the clean air is discharged into the atmosphere. A complete flow diagram of this process is shown in Figure #2.

Calculations:

During the HVR event, two measurements are taken, of both the influent and effluent flow rates, the concentrations of the vapors removed (before off-gas treatment), and the off-gas treatment system concentrations. These measurements are used to calculate the removal rates and the off-gas emission rates. The flow rates were measured using a Dwyer DS-300 Pitot tube attached to a differential pressure gauge. These flow rate measurements are reported in Actual Cubic Feet per Minute (ACFM). Before each event, these flow assemblies are calibrated to insure an accurate flow measurement. A separate flow rate is calculated for each influent well (if more than one well is connected), as well as for any additional fresh air that is introduced into the influent stream. The individual flow rates are combined to achieve the total flow and velocity derived from the extraction points. Because of the extremely high concentrations involved with a High Vacuum event, additional quench air (0 to 2,000 SCFM) is added to the vapor stream, just before entering the ThOx unit. An additional Pitot tube assembly is installed at the inlet of the ThOx unit and is used to measure the total flow. Combined with the off-gas concentration readings, this total flow rate is used to calculate the destruction efficiency of the system.

The concentration measurements are taken using a TVA-1000A FID instrument calibrated to methane. For comparison purposes, the removal rates are calculated in total carbon, as well as total hydrocarbons. This FID instrument has a dynamic range of 0-50,000 PPM as methane, 0-100,000 PPM as hydrocarbon. Our concentration samples are collected before any additional bleed or quench air is added to the extracted flow rate. These undiluted concentration measurements exceed the dynamic range of any FID instrument. In order to accurately record the high concentrations observed during a HVR event, a calibrated 10:1 dilution valve is used to cut the sample. This dilution valve, along with the FID instrument, is calibrated before the start of each event.

In order to eliminate the naturally occurring methane that is present during a typical HVR event, each concentration sample is measured twice. The first sample is collected directly from the system, and recorded as the total VOC concentration. The second sample is collected using an in-line activated carbon filter, which adsorbs the hydrocarbon compounds leaving only methane present in the sample to be measured. This methane only result is then subtracted from the total VOC concentration measurement (first sample), resulting in a Non Methane Organic Compound (NMOC) concentration. This NMOC concentration is used in the mass removal calculations. However, as with any FID instrument, the NMOC results are recorded as parts per million by volume (PPM_v) as if the concentrations were methane. A conversion from methane to a hydrocarbon and from a volume to a weight is necessary to calculate an accurate mass removal rate. Using the NMOC concentration results and the TVA-1000's factory certified response ratio for hydrocarbons, the NMOC results are converted to equivalent hydrocarbon mg/Ls. A TVA-1000 FID has an average response ratio of 600 PPM_v per mg/L of unleaded gasoline and 200 PPM_v per mg/L of diesel. Summaries of these calculations are shown in Figure #3.

Results:

Phase Separated Hydrocarbon (PSH) was detected in monitoring wells MW-1 (0.01 feet), MW-2 (0.04 feet), MW-3 (0.21 feet), MW-4 (0.05 feet), MW-5 (0.01 feet), RW-2 (0.44 feet) and MW-10 (0.02 feet) prior to performing the event (well locations are shown in Figure #4). Once static water levels were established, during the course of the event the system was connected to RW-2/MW-3/MW-5 (combined), MW-2 and MW-4. At each of the extraction points a stinger was located at the static fluid levels, and once the ThOx unit's normal operating temperature was reached, the inlet flow valve was opened for these wells. Once the PSH was removed from the extraction wells (if any), the stinger assemblies were lowered into the static fluid level approximately 1 foot, creating a cone of influence.

During the 24.0 hour HVR event, the average ACFM was calculated at 46.92 for RW-2/MW-3/MW-5 (combined), with an additional 0.00 ACFM recorded at the fresh air breather port. The fresh air breather port is used during an event to enhance the volatilization and fluid recovery rates from the monitoring wells. Additionally, 30.00 ACFM was calculated for MW-2 with 5.00 ACFM recorded at the fresh air breather port, and 28.49 ACFM was calculated for MW-4 with 5.00 ACFM recorded at the fresh air breather port. A summary of the recovered flow rates are shown in Figure # 5. The combined total airflow from the extraction wells and breather ports averaged 105.41 ACFM.

Throughout the event, air concentration measurements were recorded periodically from both the influent and effluent sample ports. The concentration results were entered into the HVR field monitoring log (Attachment A) and during the event, 1047.88 pounds of carbon was removed (3497.39 pounds of hydrocarbon, 567.76 equivalent gallons of gasoline). Additionally, 147.80 pounds of methane was removed and incinerated during the event. A summary of the total equivalent hydrocarbon recovery rate is shown in Figure #6. The total off-gas discharge (to the atmosphere) was 0.07925 pounds of carbon (0.26452 pounds of hydrocarbon), thus yielding a 99.99% destruction rate for the ThOx unit. Induced vacuum readings (in inches of water column) were recorded in this event (See Attachment A for results).

Once the 24.0 hour HVR event was complete, a final round of water level measurements was recorded in which the results are shown in Attachment A. After the event, there were levels of PSH were recorded in monitoring wells MW-1 (0.19 feet), MW-2 (0.15 feet), MW-3 (0.08 feet), MW-4 (0.35 feet), MW-5 (0.42 feet), MW-9 (0.15 feet), MW-10 (0.08 feet) and RW-2 (0.05 feet). During the event, 590 gallons of petroleum contacted water (PCW) was removed and collected in a holding tank on the system and later disposed of at Aqua Terra recycling and Treatment located on Oxford, Georgia. Fruits and Associates, Inc. provided transportation of the PCW. Copies of the manifested waste transportation and disposal tickets are included in Attachment B.

This Event's Totals

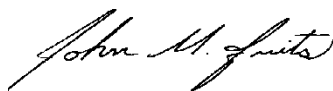
| | |
|---------------------------------------|---------|
| Total Lbs of Carbon | 1047.88 |
| Total Lbs of Methane | 147.80 |
| Total Lbs of Hydrocarbon | 3497.39 |
| Equiv. Gal. of Hydrocarbons | 567.758 |
| Total Gallons of Liquid (Groundwater) | 590.00 |
| Total Operating Time (Hours) | 24.0 |

Cumulative (To Date) Totals

| | |
|-----------------------------|----------|
| Total Lbs of Carbon | 12506.49 |
| Total Lbs of Methane | 1046.18 |
| Total Lbs of Hydrocarbon | 41741.53 |
| Equiv. Gal. of Hydrocarbons | 6776.226 |
| Total Gallons of Liquid | 3684.00 |

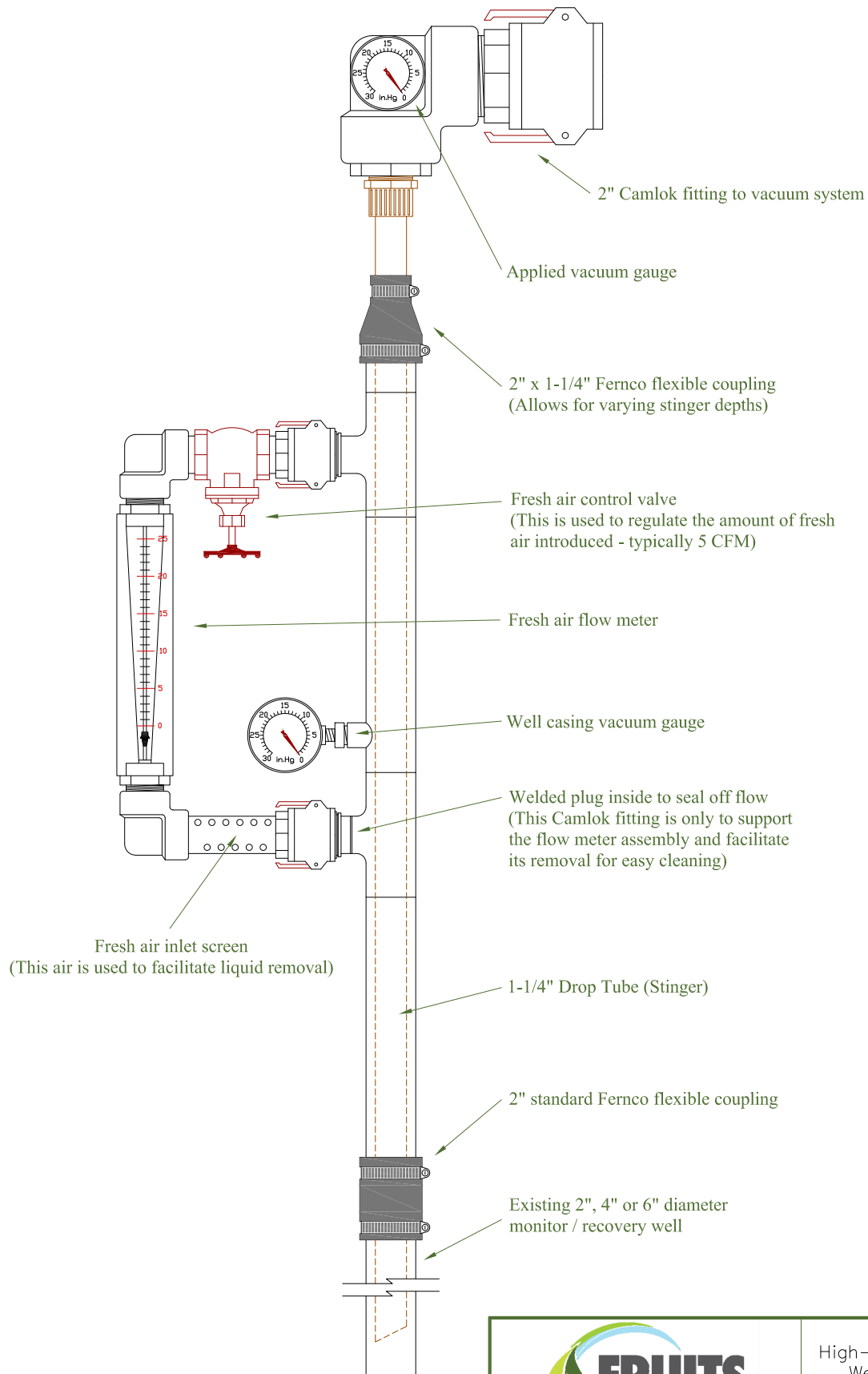
Sincerely,

Fruits & Associates, Inc.



John M. Fruits





High-Vac Remediation (HVR)
Well Manifold Assembly
(Stinger Assembly)

Scale: Not to scale

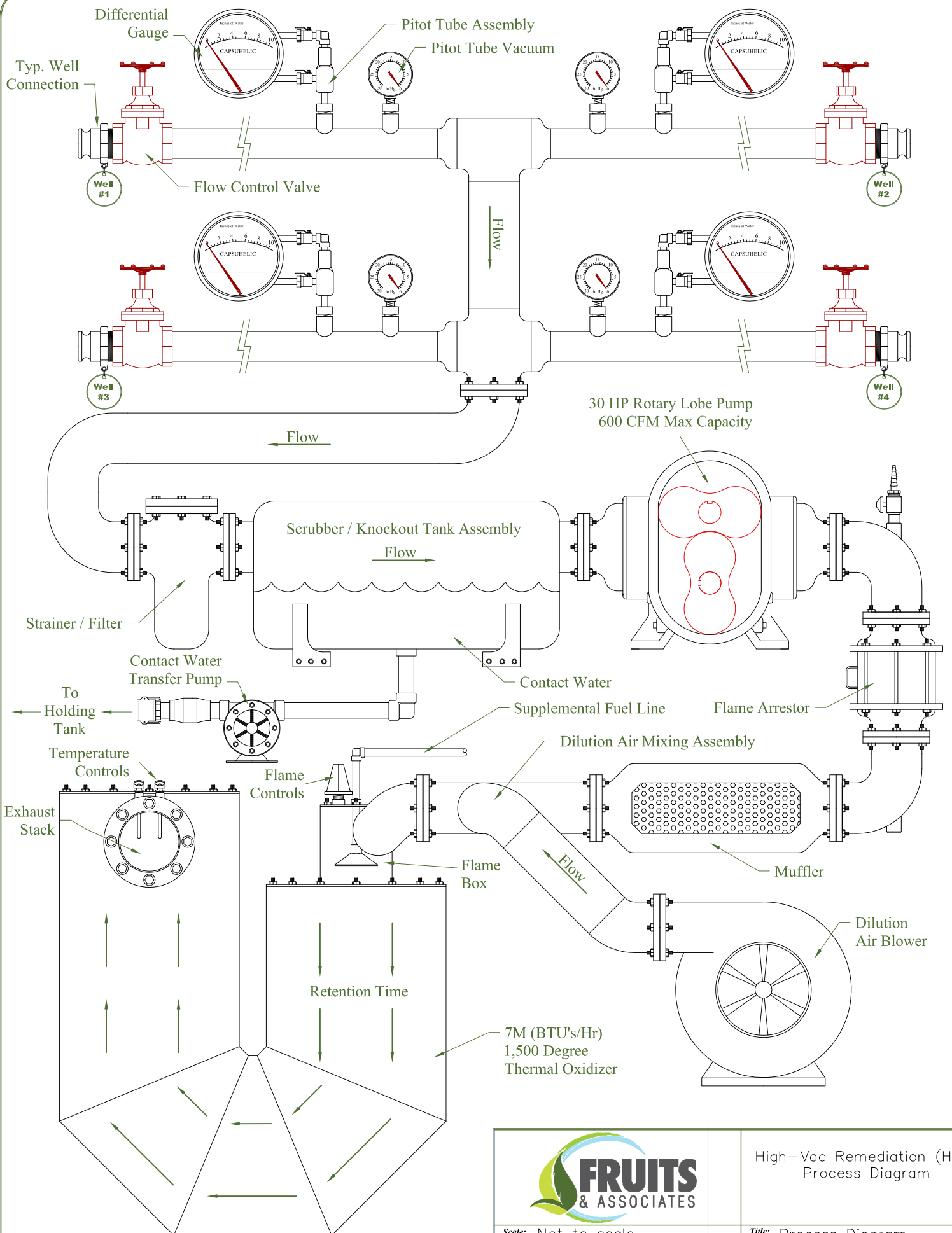
Title: Well Connection Diagram

Date: October 6th, 2014

Checked By: John M. Fruits

Drawing By: John M. Fruits

Figure #: 1



High-Vac Remediation (HVR) Process Diagram

Scale: Not to scale

Title: Process Diagram

Date: October 6th, 2014

Checked By: John M. Fruits

Drawing By: John M. Fruits

Figure #: 2

Calculation of Hydrocarbon Loading Rate

Formula:

$$\dot{m} = Q \times C \times CF$$

Where:

\dot{m} = Contaminant Loading Rate (lbs/hr)

Q = Air Flow Rate (CFM)

C = Contaminant Concentration (mg/m³)

$$CF = \text{Conversion Factor} = 0.000003743 = \frac{1 \text{ m}^3}{35.31 \text{ ft}^3} \times \frac{1 \text{ lb}}{454 \times 10^3 \text{ mg}} \times \frac{60 \text{ min}}{1 \text{ hr}}$$

Since all field measurements are in PPM_v, the following formula is used to convert to mg/m³.

$$C = \frac{\text{PPM}_v}{R} \times \frac{1,000 \text{ L}}{1 \text{ m}^3}$$

Where:

R = TVA Response Ratio*

*According to the manufacture's documentation, *The Foxboro Monitor, Volume 3, Issue 1A, Page 5, Response Ratio of Fuel Samples*, the Foxboro TVA-1000 has a response ratio of approximately $\frac{600 \text{ PPM}_v}{1 \text{ mg/L}}$ for Gasoline, $\frac{200 \text{ PPM}_v}{1 \text{ mg/L}}$ for Diesel Fuel.

Example:

Q = Air Flow Rate = 200 CFM

C = TVA-1000 Reading = 20,400 PPM_v

R = Response Ratio for Gasoline = 600

Results:

$$25.45 \text{ lbs/hr} = 200 \times \left(\frac{20,400}{600} \times 1,000 \right) \times 0.000003743$$

\dot{m} Q C R CF

Note:

To convert *lbs* to equivalent gallons, the following formula is used:
 Specific Gravity (Gasoline = 0.74, Diesel = 0.84) x Conversion Factor (8.333) = *lbs/gal*.
 (Gasoline = 6.16 *lbs/gal*. Diesel = 6.99 *lbs/gal*.)



High-Vac Remediation (HVR)
Process Diagram

Scale: Not to scale

Title: Concentration Calculations

Date: October 6th, 2014

Checked By: John M. Fruits

Drawing By: John M. Fruits

Figure #: 3



FRUITS
& ASSOCIATES

High-Vac Remediation (HVR)
Site Map Diagram

Scale: Not Applicable

Title: Site Map Diagram

Date:

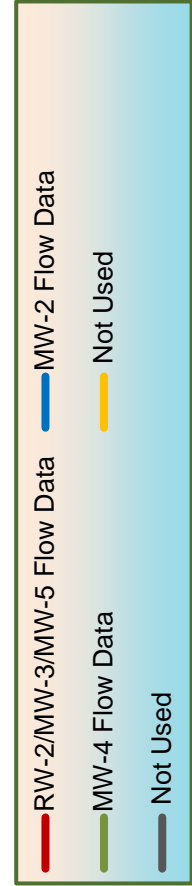
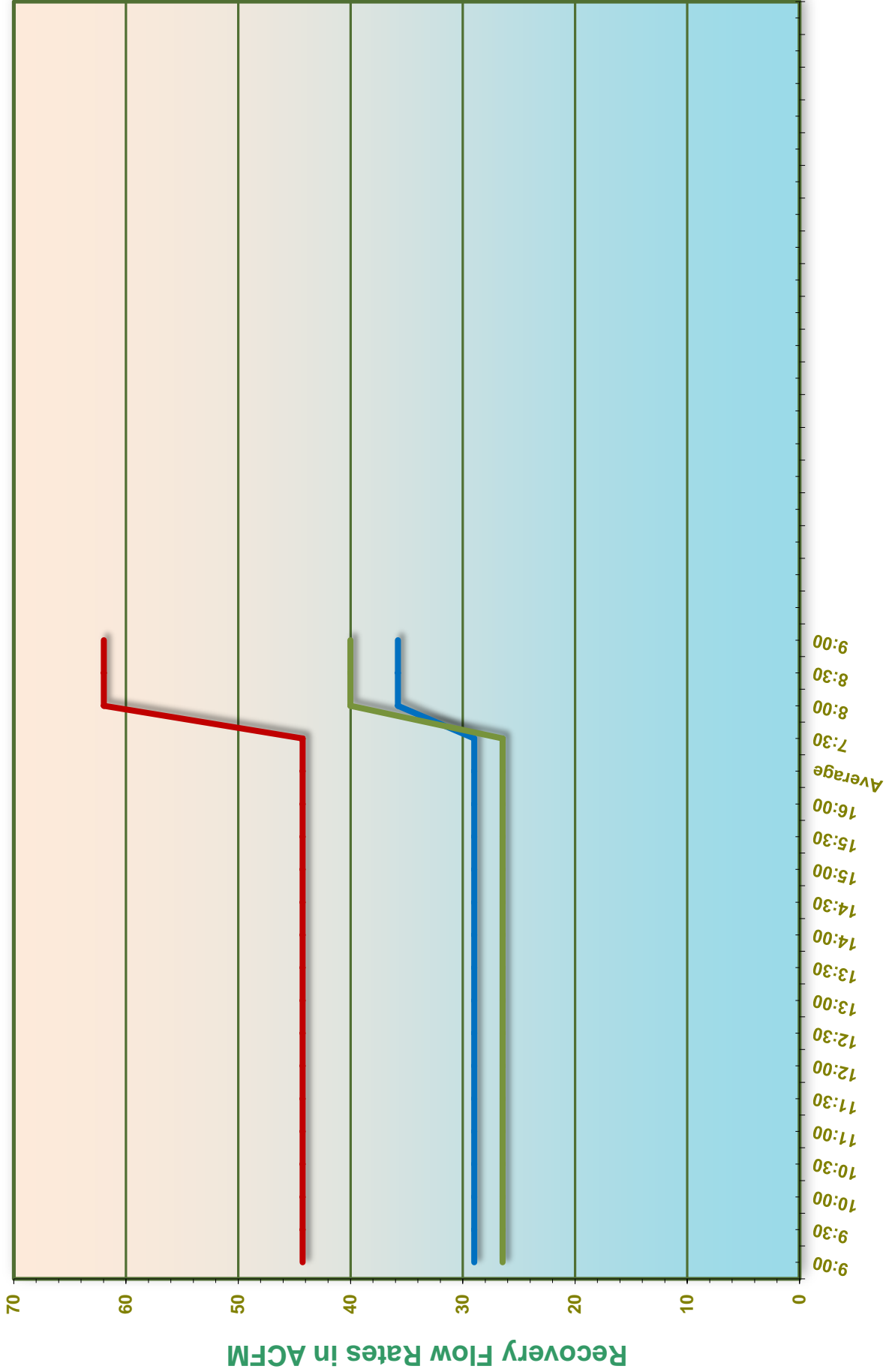
Checked By: John M. Fruits

Figure #: 4



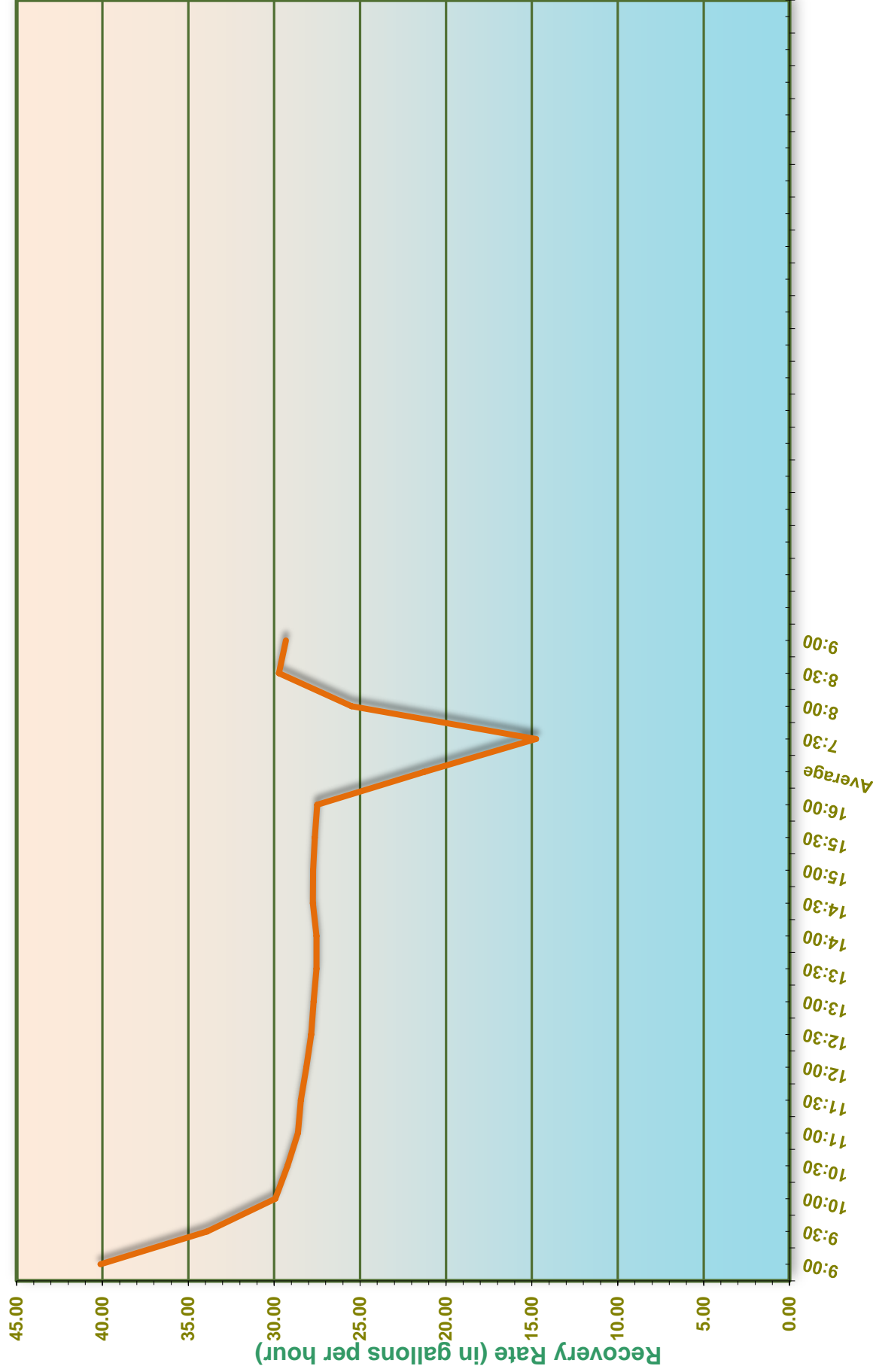
Attachment A

[illegible]



HIGH-VAC REMEDIATION (HVR)
RECOVERY FLOW RATES

| | | | |
|-------------|----------------|-------------|---------------------|
| Scale: | NOT APPLICABLE | Title: | RECOVERY FLOW RATES |
| Date: | | Checked By: | JOHN M. FRUITS |
| Drawing By: | JOHN M. FRUITS | Figure #: | |



Equivalent Hydrocarbon Recovery Rate (in GPH),
from the following extraction wells:

(RW-2/MW-3/MW-5, MW-2, MW-4)



HIGH-VAC REMEDIATION (HVR)
RECOVERY RATE (IN GPH)

| | | | |
|-------------|----------------|-------------|-------------------------|
| Scale: | NOT APPLICABLE | Title: | RECOVERY RATES (IN GPH) |
| Date: | | Checked By: | JOHN M. FRUITS |
| Drawing By: | JOHN M. FRUITS | Figure #: | |



Attachment B

P.O. Box 98
Oxford, GA 30054

| Due Date | Date | Invoice # |
|-----------|-----------|-----------|
| 9/16/2020 | 8/17/2020 | 27862 |

Bill To

Fruits & Associates, Inc.
500 North Point Parkway, Suite A
Acworth, GA 30102

| | |
|--------------------|-----------------|
| Balance Due | \$118.00 |
|--------------------|-----------------|

Aqua-Terra Recycling & Treatment

P.O. Box 98
Oxford, GA 30054

| | | |
|----------|-------------|-----------|
| P.O. No. | Terms | Invoice # |
| | Net 30 days | 27862 |

| Qty | Description | Rate | Amount |
|-----|--|------|--------|
| 590 | Petroleum Contact Water (gallons) - Manifest No. 12181 | 0.20 | 118.00 |

We appreciate your business!
There will be a \$36.00 charge for all returned checks. 10% interest will be assessed on all unpaid balances after 90 days. A fee of 4% will be added to credit card payments. For billing inquiries: 678-625-4025.

| | |
|-------------------------|----------|
| Total | \$118.00 |
| Payments/Credits | \$0.00 |
| Balance Due | \$118.00 |

FRUITS Associates, Inc

500 North Point Parkway, Suite A

Acworth, Georgia 30102

(770) 974-6999 Fax: (770) 974-4888

NON-HAZARDOUS WASTE MANIFEST

F&A Project #: GA20-9218

Manifest Number: 12181

Section 1: GENERATOR

Generator Name: Mayor's Point

Generating Location: Same

Address: 1100 Bay Street

Address: _____

City: Brunswick State: GA Zip: _____

City: _____ State: _____ Zip: _____

Phone No.: _____ Fax: _____

Phone No.: _____ Fax: _____

Description of Waste: Petroleum Contaminated Water

Quantity

590

in U.S. Gallons

I hereby certify that the above named material is not a hazardous waste as defined by 40 CFR part 261 or any applicable state law, has been properly described, classified and packaged, and is in proper condition for transportation according to applicable regulations.

Spencer Burr
Generator Authorized Agent Name

Spencer Burr
Signature

8-11-20
Ship Date

Section 2: TRANSPORTER

Transport Company

Additional Transport Company

Company Name: Fruits & Associates, Inc.

Company Name: Same

Address: 500 North Point Parkway

Address: _____

Suite A

City: Acworth State: GA Zip: 30102

City: _____ State: _____ Zip: _____

Phone No.: 770-974-6999 Fax: 770-974-4888

Phone No.: _____ Fax: _____

Driver Name / Title: Todd Close

Driver Name / Title: Carl N. Wilson

Truck #: 353945 Vehicle Tag: 28A0572

Truck #: 140686 Vehicle Tag: 2399287

Todd Close
Driver Signature Date: 8-11-20

Carl N. Wilson
Driver Signature Date: 08/17/2020

Section 3: DESTINATION / DISPOSAL FACILITY

Company Name: Aqua-Terra

I hereby certify that the above material has been accepted and to the best of my knowledge the foregoing is true and accurate.

Address: 710 Moore Street

City: Oxford State: GA Zip: 30051

Name of Authorized Agent / Title

Phone No.: _____ Fax: _____

Jonathan Gray
Signature Date: 8-17-20

Discrepancy: _____